

finger and straight posterior edge (destroyed in dissection on one side). BRA semicircular; 8 or 9 BRA papillae, all relatively simple, conical or with tapered tips, thin. Lateral-roof papillae forming continuous arc just lateral to BRA papillae, 9 or 10 on each side; entire BRA filled with 40–50 large, distinct pustulations. Glandular zone present; secretory cells, but no distinct pits, not organized into distinct band; indistinct zone about 10% length of buccal floor with irregular anterior wavy margin; not continuous across midline. Dorsal velum 15% length of buccal floor; very distinct across the midline forming a continuous elevated ridge with a crenulate margin.

Pharyngeal Cavity: Single, poorly defined, elongate, oblique pressure cushion on each side. Ciliary groove very broad and shallow, not continuous with esophagus.

Heleioporus species

FIGURE 43

MATERIAL.—No number (one specimen dissected, stage 29, SVL 8.2 mm). Collected from Perth, Western Australia, by D.S. Liem.

REFERENCE.—Watson and Martin (1973) described the external morphology of *H. australiacus*, which is similar to the tadpole dissected.

GENERAL REMARKS.—Lungs present, relatively large, destroyed in dissection.

VENTRAL ASPECT.—*Buccal Cavity*: Floor of mouth as wide as long, triangular. Two infralabial papillae on each side in a transverse row; subequal in size; tall palps with smooth posterior and medial edges but very knobby apices and anterior surfaces; all 4 directed anteromedially; additional transverse row of tiny papillae right at base of lower beak in line with apices of infralabial papillae. Two tall, distinct, lingual papillae. BFA V-shaped; 12 or 13 BFA papillae of quite irregular size, overall medium to small; those medial to buccal pockets arising from common obliquely oriented base; largest 2 papillae on each side terminally bifurcate. Irregular cluster of 4 knobby prepocket papillae on each side. Just posteromedial to buccal pockets, 2 papillae on one side, 4 on other running in oblique row merging with BFA papillae; 2 very small papillae in a field of about 20 small pustulations in posterior $\frac{1}{2}$ of BFA. Buccal pockets very long, almost as long as wide; average depth, about 10% length of buccal floor; spicules present; posterior margin symmetrical and wavy with a distinct crest overlying each filter cavity on each side; wide and rounded peaks with a very broad crest defining a median notch; thickened rim of secretory tissue along entire edge with distinct secretory pits.

Pharyngeal Cavity: Branchial baskets average size, oblique ovals, each about $\frac{1}{3}$ remaining area of buccal floor; 50% wider than deep; 1st and 2nd filter cavities approximately equal size, 3rd slightly smaller; filter cavities oriented 45° from midline. Dorsal edge of 2nd filter plate relatively straight, 3rd

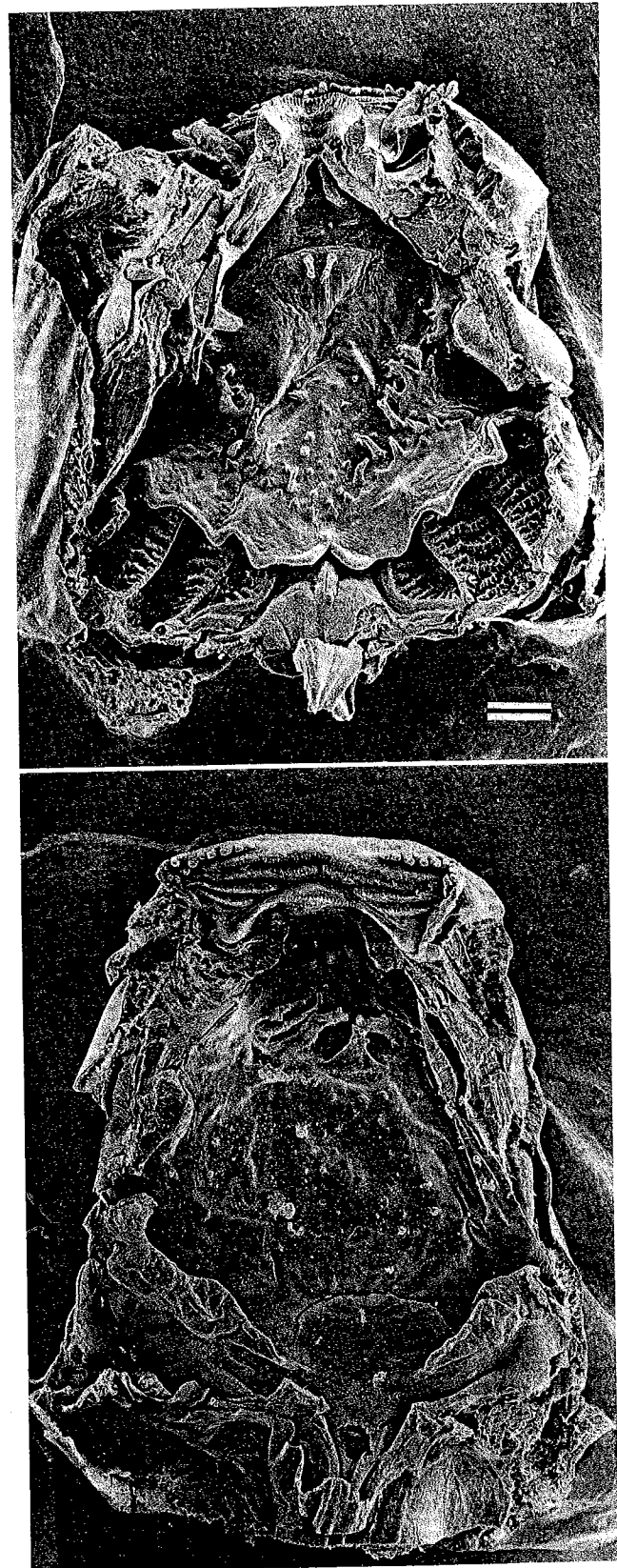


FIGURE 43.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Heleioporus* species; scale line = 400 μ m.

dorsal edge curving slightly upward; filter plates tall, about as tall as long; plates tipped at 45° such that 2nd and 3rd filter plates covering about 25% medial filter cavity; cb 1 with 6 filter rows, cb 2 with 7 or 8, cb 3 with 7, cb 4 with 6. Filter mesh of average to low density; no filter rows abutting; filter canals as wide or wider than most of rows, 50% canopied; tertiary filter folds common, no higher order folds; filter rows of average width. Branchial food traps with irregular but distinct secretory ridges. Glottis 100% visible from above; of average size; open; glottal lips tall, distinct; laryngeal disk not well defined. Esophageal funnel narrow, of average bore.

DORSAL ASPECT.—Buccal Cavity: Roof of mouth diamond-shaped, elongate; nares 20%–25% distance from front of mouth to esophagus; median ridge 30% distance from front of mouth to esophagus. Transversely oriented knobby ridge in prenarial arena. Nares of average size, internarial distance about 50% length of naris; nares obliquely oriented; anterior narial wall with distinct rugosities at medial edge as well as distinct prenarial papilla $\frac{2}{3}$ distance posterolaterally; posterior narial wall with small but distinctly triangular papilla at medial terminus. Single postnarial papilla on each side, very large, sickle-shaped; medially directed apex with rugose anterior edge, almost as tall as length of naris; no other papillae near nares. Median ridge a tall triangular flap with a truncated jagged apex; median ridge equal in height to length of postnarial papillae. Single lateral-ridge papilla on each side posterolateral to median ridge (destroyed in dissection on one side), smaller than single postnarial papilla by nearly 40%; lateral-ridge papilla a rectangular longitudinally oriented flap with slightly sculptured apex on one side. No BRA papillae; a dozen or so pustules scattered around buccal roof. Faint glandular zone present, secretory pits at very low density, glandular zone about 10% length of buccal floor, with smooth, anterior, arched margin. Dorsal velum short, broadly interrupted on midline with gently wavy free edge; no marginal papillation.

Pharyngeal Cavity: Two small, ill-defined, oval, obliquely oriented pressure cushions of subequal size on each side. Ciliary groove distinct and broad.

Limnodynastes tasmaniensis Günther

FIGURE 44

MATERIAL.—No number (one specimen dissected, stage 37, SVL 20.7 mm). Collected from "Oakdale," near Sutton, New South Wales, Australia.

REFERENCE.—Watson and Martin (1973) described the larva.

GENERAL REMARKS.—Lungs smaller than average, unequal in size, length of longest about equal to length of floor of mouth; not inflated. Short but dense gill filaments.

VENTRAL ASPECT.—Buccal Cavity: Floor of mouth triangular, 20% wider than long. Four widely separated infralabial papillae in a transverse row; all elongate, anteroposteriorly compressed with pointed apices and a variety of surface

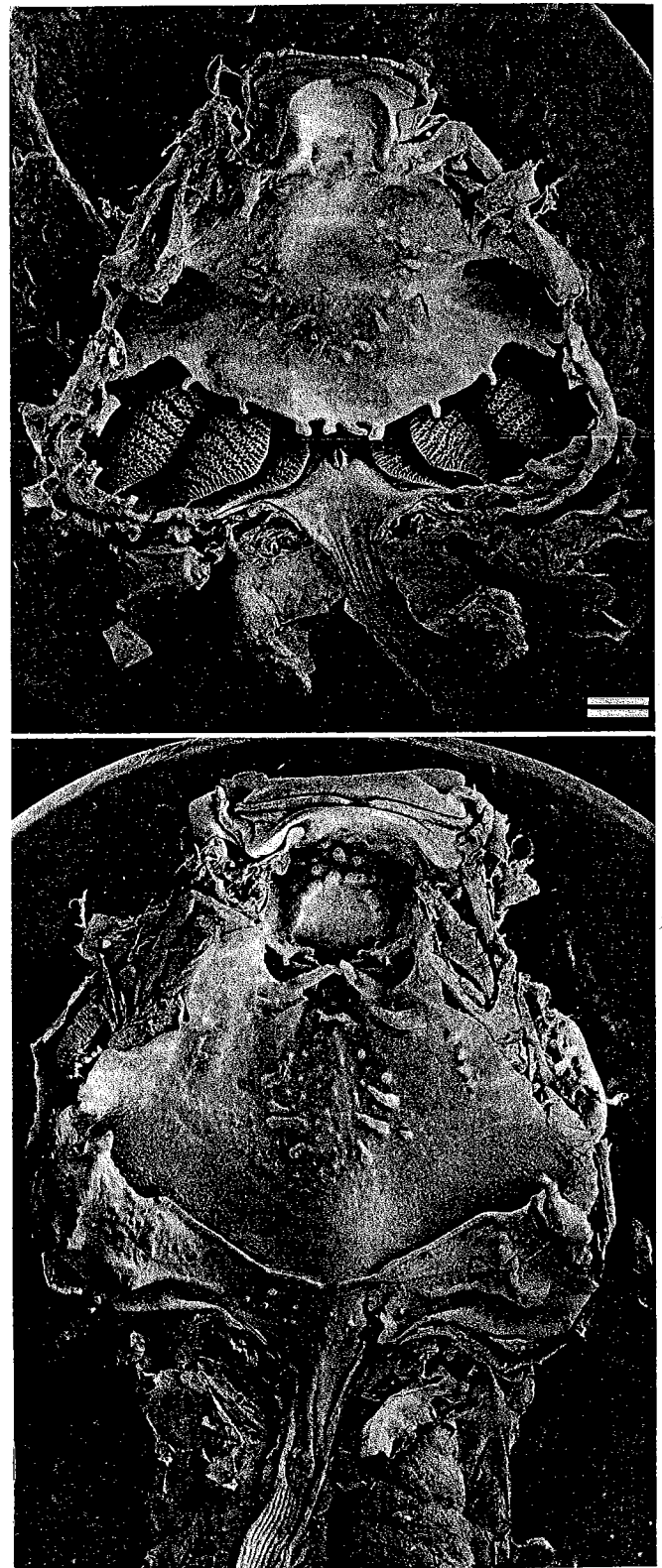


FIGURE 44.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Limnodynastes tasmaniensis*; scale line = 1 mm.

sculpturing, lacking bifurcations; in addition, small pustulations far forward in a transverse row. Two simple, thin, cone-shaped lingual papillae. BFA egg-shaped; about 10 BFA papillae on each side; BFA papillae thin, conical, non-bifurcate with very few surface rugosities; several with a curved apex. Two small pre-pocket papillae per side. Six to twelve small pustulations anterior to buccal pockets; 4 unequal-sized papillae in a transverse row running anterior and lateral to posterior and medial, beginning posteromedial to buccal pockets; about 12 tiny pustulations scattered about the posterior $\frac{1}{2}$ of BFA. Buccal pockets average size; about 4 times as wide as long, relatively shallow; more transversely oriented than obliquely; not perforated. Free velar surface of average length; area of each side about $\frac{1}{6}$ – $\frac{1}{8}$ area of rest of buccal floor; conspicuous, thin, spicular support; posterior margin forming gentle semicircle with relatively small, distinct peaks above 2nd, 3rd, 4th filter plates on each side and a single medium-sized papilla bounding the median notch on each side; median notch deep; secretory pits dense on margins of papillae and in a thin band along the remaining free edge of the ventral velum.

Pharyngeal Cavity: Branchial baskets 50% wider than long, triangular; area of each branchial basket about 80% area of remainder of buccal floor area; branchial baskets twice as wide as deep; first and 2nd filter cavities subequal, 3rd 30% smaller; filter cavities longitudinally oriented, especially 1st and 2nd, with 3rd oriented at 45° to sagittal plane. Dorsal edge of 2nd filter plate arching up and coiled slightly so edge pointing inferiorly and medially, top of 3rd filter plate curved upward sharply; 1st filter plate about twice as long as tall, 2nd about 50% longer than tall, 3rd and 4th as long as tall; filter plates moderately imbricated, 2nd filter plate covering about 25% of 2nd filter cavity, 3rd filter plate covering about 80% of 3rd filter cavity, 2nd and 3rd filter plates tipped at 45° except for curving dorsal edges; cb 1 with 11 filter rows, cb 2 with 12, cb 3 with 11, cb 4 with 7. High-density filter mesh; quaternary folds on most rows; filter rows relatively uniform and of average width; filter rows not abutting except ventrally; filter rows 25% wider than filter canals, canals 90% canopied. Branchial food traps large with secretory ridges conspicuous under light microscope, secretory ridges large and of uniform dimensions. Glottis 100% visible from above, small, occluded, with sharp, thin lips; faint laryngeal disk. Esophageal funnel narrow, esophagus of average to narrow diameter.

DORSAL ASPECT.—*Buccal Cavity:* Roof of mouth triangular, a bit wider than long; nares 25% distance from front of mouth to esophagus; median ridge 40% distance from front of mouth to esophagus. Prenarial arena with an anteriorly convexed arch supporting a row of about 10 short squat papillae/pustulations; arch extending to base of anterior narial wall; in addition, 5–10 pustulations scattered anterior to arch in pre-narial arena. Nares large; internarial distance about $\frac{2}{3}$ length of naris; nares oriented obliquely with lateral corner slightly anterior to medial corner; anterior narial wall forming a strong triangular flap with a posteroventrally directed,

pointed apex and a small, anteriorly directed, tab-like process on the medial edge of the anterior wall; posterior narial wall a simple thin flap of uniform height except for a tiny, faint, narial-valve projection near median end of valve. Postnarial arena defined by single large papilla arising approximately midway between the lateral edge of naris and lateral edge of median ridge on each side; postnarial papilla directed anteromedially with apices of each almost touching; postnarial papillae simple columns with some rugosity on anterior surfaces. Median ridge a small semicircular flap with some faint rugosities on the anterior surface otherwise lacking sculpturing. Lateral-ridge papillae arising from buccal roof immediately lateral to median ridge; simple, sickle-shaped structures, similar in shape to, but 50% smaller than, postnarial papillae. BRA V-shaped; 3 simple, conical BRA papillae on one side, 4 on other. Longitudinal line of small papillae laterally on buccal roof made up of 4 papillae on one side, 2 on other, plus a couple of pustulations; 1 or 2 very small papillae just posterior to lateral portion of BRA; many small pustulations scattered within BRA, smallest and most densely packed in posterior portion of BRA. Glandular zone of uniform length, about $\frac{1}{8}$ length of rest of buccal roof; glandular zone made up of large, relatively dense secretory pits, continuous across the midline with a distinct anterior border. Dorsal velum of average length; just interrupted on midline; lacking marginal papillation; 2–4 small papillae posterior to dorsal velum just to side of midline.

Pharyngeal Cavity: Two pressure cushions on each side; lateral larger, longitudinally oriented, oval; medial smaller and more spherical. Ciliary groove of average width, shallow.

Megistolotis lignarius Tyler, Martin, and Davies

FIGURE 45

MATERIAL.—KU 180057 (one specimen dissected, stage 29, SVL 12.9 mm). Collected from 4 km N Lake Argyle Village, Western Australia, Australia.

REFERENCE.—Tyler et al. (1979) described and illustrated the larva.

GENERAL REMARKS.—Specimen in poor condition and did not prepare well for SEM; not all features discernible in figure. Lungs well developed, about equal in length to buccal floor; inflated. Gill filaments present.

VENTRAL ASPECT.—*Buccal Cavity:* Floor of mouth round, about as long as wide. Two pairs of infralabial papillae, dorsoanterior pair small, cup-like, with anterior ragged edges; second pair slightly more ventral and medial, slightly smaller. Two lingual papillae; tall and thin with slightly roughened surfaces. BFA broadly U-shaped; 15–20 BFA papillae, all relatively small, tall, conical, subequal, a few sickle-shaped; BFA papillae a bit rugose, none bifurcate. Three pre-pocket papillae per side, similar in size to BFA papillae. About 20 papillae scattered in posterior $\frac{1}{2}$ of BFA; small row of 4 or 5 papillae running anterolateral to posteromedial in region

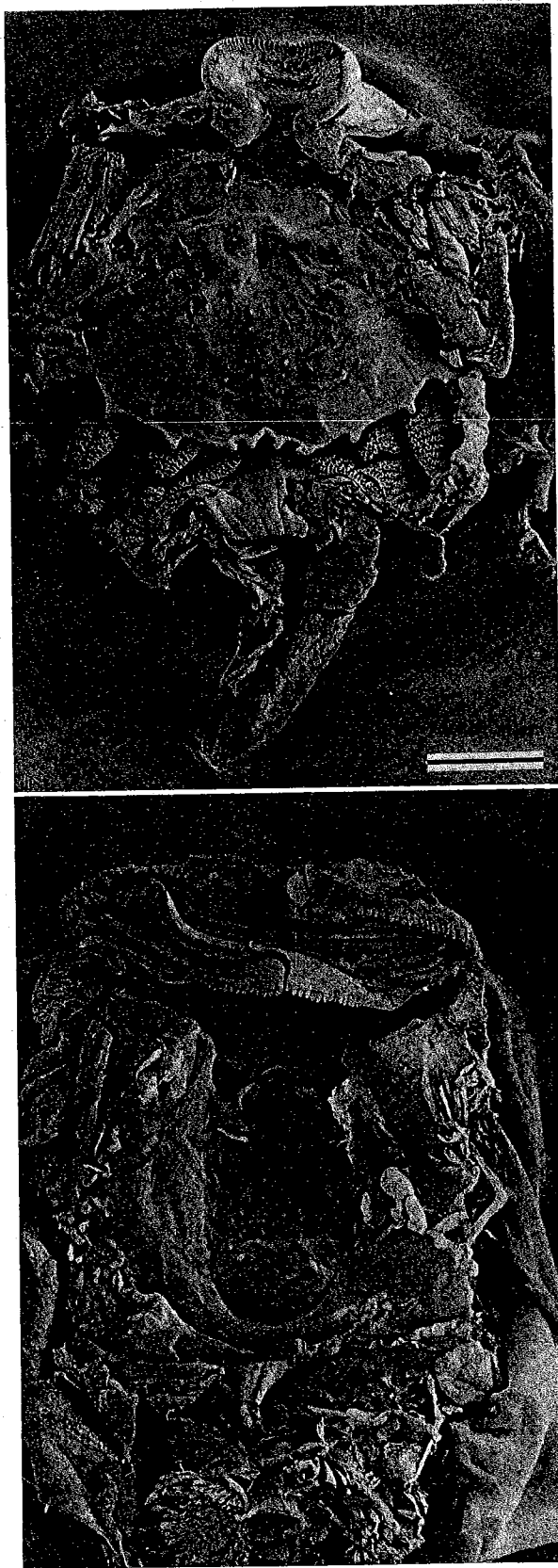


FIGURE 45.—SEM micrographs of floor (above) and roof (below) of oral cavity of *Megistolotis lignarius*; scale line = 1 mm.

posteromedial to buccal pockets. Buccal pockets small; 3 times as wide as long; oblique; perforation uncertain. Free velar surface 15%–20% length of buccal floor; spicules conspicuous and broad; posterior velar margin of average length, a smooth arch with distinct marginal papillae directly dorsal to 2nd, 3rd, and 4th filter plates on each side; peaks above 4th filter plate pointing medially; median notch deep, surrounded by single papilla of average size on each side; posterior margin with thin but continuous band of small secretory pits.

Pharyngeal Cavity: Branchial baskets of average size, as wide as tall, triangular, longitudinally oriented, 40% rest of buccal floor area, very deep; filter cavities subequal in size. Second, 3rd, and 4th filter plates with free dorsal margin bowing upward; filter plates 20% longer than tall; ventrally, plates vertical, but dorsal edge tilting over medial portion of filter cavity; dorsal edge arched but tipped medially; cb 1 with about 8 filter rows, cb 2 with about 11, cb 3 with 10, cb 4 with 10. Filter mesh moderately dense; many quaternary folds; ventrally filter rows wide, most rows complete; at least $\frac{1}{4}$ filter rows contacting neighbors; filter canals slightly narrower than filter rows, 80% or more canopied. Branchial food traps with well-formed, uniform secretory ridges (Figure 58c,d). Glottis small, fully exposed in median notch; laryngeal disk not visible, laryngeal lips medium to small in size. Esophageal funnel narrow.

DORSAL ASPECT.—Buccal Cavity: Roof of mouth triangular, about as long as wide; nares 20% distance from front of mouth to esophagus; median ridge 50% distance from front of mouth to esophagus. Prenarial arena long and large with faint, ridge-like, anteriorly directed arch with weakly pustulate, free ventral edge. Nares of average size, fully open, internarial distance about 80% width of naris; nares obliquely oriented anterolaterally to posteromedially; anterior narial wall with weak triangular flap as a prenarial papilla; posterior narial wall very thin, no narial-valve projection. Four postnarial papillae per side, largest on each side immediately posterior to medial $\frac{1}{3}$ of nares; attenuate, curved medially; immediately posterolateral to large papillae, a small attenuate papilla on each side, much farther posteriorly, directly anterior to lateral edge of median ridge, two similarly small but simpler papillae; about 6 additional pustulations scattered in postnarial arena. Median ridge a small trapezoidal structure with a jagged apex. Lateral-ridge papillae lobster claw-shaped, arising from a longitudinally oriented ridge; each lateral-ridge papilla nearly twice size of median ridge proper; each lateral-ridge papilla laterally compressed, bifurcate, with jagged apices and jagged, anterior, free edge. BRA an elongate rectangle, poorly defined by 5 simple, thin, conical papillae on each side. Cluster of 3 small, lateral-roof papillae on each side; about 50 small pustulations scattered within BRA proper. Glandular zone of large, conspicuous, secretory pits forming continuous band across midline; zone with relatively smooth anterior edge. Dorsal velum of average length, not continuous on midline, barely interrupted, smooth.

Pharyngeal Cavity: Two pressure cushions per side, of

